

An Roinn Oideachais agus Scileanna

Department of Education and Skills

**Subject Inspection of Mathematics
REPORT**

**St Dominic's College,
Cabra, Dublin 7
Roll number: 60731F**

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**AN ROINN DEPARTMENT
OIDEACHAIS OF EDUCATION
AGUS SCILEANNA AND SKILLS**

**REPORT
ON
THE QUALITY OF LEARNING AND TEACHING IN MATHEMATICS**

SUBJECT INSPECTION REPORT

This report has been written following a subject inspection in St Dominic's College, Cabra. It presents the findings of an evaluation of the quality of teaching and learning in Mathematics and makes recommendations for the further development of the teaching of this subject in the school. The evaluation was conducted over two days during which the inspector visited classrooms and observed teaching and learning. The inspector interacted with students and teachers, examined students' work, and had discussions with the teachers. The inspector reviewed school planning documentation and teachers' written preparation. Following the evaluation visit, the inspector provided oral feedback on the outcomes of the evaluation to the principal, deputy principals and subject teachers. The board of management of the school was given an opportunity to comment on the findings and recommendations of the report; the board chose to accept the report without response.

SUBJECT PROVISION AND WHOLE SCHOOL SUPPORT

St Dominic's College, Cabra has a current enrolment of 901 girls. Timetable allocation for Mathematics is very good.

Students are assigned to higher and ordinary level bands on the basis of general ability at the beginning of first year and remain in these groupings for the duration of the junior cycle. The abilities are mixed within the level bands. Under this arrangement it is possible for a student to be assigned to a level for Mathematics that is not appropriate for her ability. When this occurs alternative arrangements are made. This could mean a change of class group, for some other subjects, for the student at the beginning of second year. At present there are a small number of second and third year students who are being taught Mathematics in a class group that is not suited to their ability. The school has made efforts to address this issue; however, the arrangements made for such students are not satisfactory. For example, where a student of higher level ability is misplaced in an ordinary level class, she may be taught ordinary level Mathematics for part of the week and may then be assigned to a higher level class group whose lessons run concurrent to her ordinary level group for the remainder of the week. It is recommended that, for the remainder of this current school year, class groups containing higher and ordinary level students be taught as mixed groups catering for both levels.

It is strongly recommended that the school review the arrangements made with regard to assignment to class groups and levels. Consideration should be given to delaying level choice until second year by assigning students to mixed-ability groups in first year. This measure would allow students to settle into first year before decisions regarding levels are made; it would allow teachers to have a greater role in these decisions and would avoid providing students with an explicit statement of expectation that might go on to define them. This, in turn, would enable advantage to be taken of the correlation known to exist between levels of teacher expectation and

levels of student achievement and it would mitigate the de-motivating effects on students than can result from being placed in low ability groupings. The research available in this area should be consulted as part of the review. 'Moving Up' and the longitudinal study, following students through second level education, carried out by the Economic and Social Research Institute (ESRI) are recommended for consideration.

In each of first, second and third year there are two class groups whose lessons are concurrently timetabled for Mathematics; this is to allow learning support to be provided through the provision of an additional teacher and the creation of a third class group. Where it is possible, two class groups are concurrently timetabled to facilitate the placing of students in appropriate level groups. However, the majority of mathematics lessons in these year groups are not concurrently timetabled. This arrangement does not allow all students the flexibility to change levels where the need arises. It is recommended that mathematics lessons, for any year group where students are assigned to higher and ordinary classes, be concurrently timetabled where possible. This would allow each student to be placed in a class group that is appropriate to her ability in Mathematics.

All fifth and sixth year class groups are concurrently timetabled which is a good arrangement. Transition year (TY) students are assigned to higher and ordinary level groups for Mathematics and there is some concurrent timetabling of TY lessons. In order to reduce the pressure that concurrent timetabling places on the timetabling process consideration should be given to assigning students to mixed-ability TY class groups; this would eliminate the need to have TY classes running at the same time. In order to optimise the value of this arrangement the mathematics department would need to work together on developing the TY plan to ensure that it is suitable to be taught in a mixed-ability setting.

The mathematics department comprises seventeen teachers and there is good rotation of levels in both the junior and senior cycles. School management supports teacher continuing professional development (CPD). Whole school CPD in areas such as differentiation of learning and Assessment for Learning (AfL) have been organised in addition to attendance at the workshops provided in preparation for *Project Maths*.

There is very good whole school support for Mathematics in terms of provision of resources. Every classroom is fitted with a PC or interactive whiteboard and ceiling-mounted data projector with audio facility. The schools computer rooms can also be booked for Mathematics lessons. There was good use of these facilities observed in the evaluation. Other resources available for teaching and learning in the subject include geometry equipment, class sets of calculators, dice, playing cards, 3-D solids, and trundle wheels. Students create clinometers in TY for use in their study of trigonometry; this very good practice is also appropriate for third and fifth years and extending its use to these year groups should be considered.

Appropriate procedures are in place for identifying students who have learning support needs in Mathematics. Support is provided through the creation of smaller class groups. Consideration should be given to team teaching as an additional means of providing learning support in Mathematics. In preparation and training for this measure the Department of Education and Science publication, *Guidelines for the Inclusion of Students with Special Educational Needs* and the co-operative teaching e-learning module on the Special Education Support Service (SESS) website should be consulted.

Very good opportunities are provided for students to engage in extracurricular mathematical activities. These include participation in the Irish Mathematics Teachers' Association Junior Mathematics Competition. In addition, there are plans to enter students for the *John Hooper*

Medal for Statistics competition organised by the *Central Statistics Office*. It is also very good that students with exceptional mathematical ability are encouraged to apply for courses that are run by the Centre for Talented Youth in Ireland that take place in Dublin City University. Students' interest in Mathematics is encouraged through visiting Broombridge, to view 'Hamilton's Equations' and also visiting the 'Digiyouthz' open day in Microsoft's head office. This is valuable in allowing students to experience Mathematics for pleasure.

PLANNING AND PREPARATION

Formal planning meetings for Mathematics are held four times per year as part of the school planning process. In addition, lunchtime meetings and informal meetings of mathematics teachers frequently occur. Minutes are kept of all formal meetings and these indicated that valuable discussion around the identification of issues and the proposing of solutions to address them takes place. A co-ordinator and a secretary for the department have been appointed by agreement between subject teachers. There is currently no defined term of office for these positions. It is recommended that an appropriate time frame be agreed and that the positions be filled on a rotational basis to allow for the sharing of this work and for the development of expertise amongst members of the teaching team.

Considerable work has been completed on the mathematics plan and a very good plan has been developed. In keeping with good practice it is updated regularly. The plan contains all of the relevant policy documents for Mathematics as well as common programmes of work for each year group and level. These are set out in terms of topics to be covered within time frames. It is now appropriate for planning work to be directed towards incorporating *Project Maths* in the development of the programmes of work. The content of the new syllabus documents is described in terms of learning outcomes. It is therefore recommended that the syllabus documents now become the focus for planning the programmes of work and that this work centre on interpreting the syllabuses. This should be done in a way that exploits cross-topic links and ensures a solid understanding of the learning outcomes for students is achieved. Work should also be done on matching the learning outcomes on the syllabuses to the corresponding teaching and learning plans provided by the *Project Maths* development team. This is recommended with a view to the mathematics department's development of teaching and learning plans similar to those provided by the *Project Maths* team.

The TY programme includes a combination of leaving certificate material and of Mathematics that is not on the examination syllabuses which is good practice. For example, students are provided with the opportunity to complete mathematical projects and to engage in solving puzzles as a way of developing their problem-solving skills. However, the TY lesson observed and the plan of work for the particular class group visited relied heavily on topics such as algebra, geometry and trigonometry. It is recommended that all TY groups follow a common programme of work that focuses on providing alternative mathematical experiences for students. Consideration should be given to including Applied Mathematics, financial Mathematics and budgeting, number theory and chaos theory to add more variety and to make the TY programme suitable for mixed-ability groups. Furthermore, it is recommended that the mathematics teaching team work together on sharing ideas for the development of the TY programme.

TEACHING AND LEARNING

Twelve lessons were observed during the evaluation and in most cases the quality of teaching and learning was very good. In all cases teacher explanations and instructions were clear and in most cases they were conceptual. Teachers shared the learning objectives of the lessons with the students at the beginning of each lesson which is very good practice. Most lessons progressed at an appropriate pace. In one classroom visited, however, students learning would have benefited from a slower pace of teacher explanations. This would have allowed the concepts to be explored more comprehensively in the explanation phases and would have avoided the large amount of questions that were asked by students throughout the lesson. It is recommended that all explanations progress at a pace that ensures that enough time is provided for the concepts being taught to be fully explored.

A good variety of methodologies was used in the classrooms visited and these included; discovery and investigation, pair and group work, and teacher exposition. The range of ICT used included PowerPoint presentations and geometry software 'geogebra'. In addition, one lesson in the computer room was observed. Teachers varied the learning activities throughout lessons to actively engage students. A lesson on statistics; opening with a quiz, progressing to the drawing of bar charts and concluding with a student survey, created a vibrant learning environment for students and provided a good example of this.

Various questioning strategies were used in lessons. These included quick questions to assess understanding and to involve students and open questions to engage students in exploring the underlying ideas in the lessons. In many cases students were expected to explain their reasoning and in some classrooms visited active mathematical discussions and debates took place. This was all very positive. Students actively participated in their own learning by asking questions and in all cases teachers listened carefully and answered students' questions accurately.

A good balance between teacher talk and student activity was a feature of almost all lessons. However, there was one exception; in this case a large proportion of class time was taken up with teacher input and there was evidence that the students lost interest and disengaged. It is therefore recommended that the value of class time be optimised by including a variety of strategies to ensure that students remain actively engaged as learners for the duration of lessons.

In most cases teachers facilitated learning activities that exposed the underlying concept to be understood by students. A good example of this was finding the slope of a line by the method of dividing 'the rise' by 'the run'. Best practice in this regard was observed in a lesson on co-ordinate geometry. The lesson opened with a quick game to revise the work of the previous lesson; this was very enjoyable for students and was a very good way to capture their attention. This was followed by the students completing a series of very well chosen exercises designed to expose the concept being taught. As each exercise was completed the teacher asked the students to describe what they had noticed and worked with them in understanding each new idea presented. All of the main concepts covered in this excellent lesson were treated in this way with the students discovering for themselves, and at their own pace, the underlying ideas. The students of this class group demonstrated a very high level of interest in the lesson material and an enthusiasm for the subject.

Teachers were careful to contextualise learning material by relating the work of lessons to real life or to students' personal experience. A lesson observed on statistics provided an example of

best practice in relation to this. The topics covered in this excellent lesson included the mean, the mode, the median, the standard deviation, and a scatter plot of a set of data. This data comprised the result of a class survey on the number of 'late stamps' in each of the students' school journals. The teacher used every opportunity to exploit the students' interest in the data in exploring the main ideas being taught. In particular, the familiar context of the data contributed to the levels of interest in the discussion on how statistics can be used to deliver different messages. At the close of the lesson the students were introduced to what would be the work of the next lesson which included using similar data for an entire year group to work out averages and standard deviation; work that would involve frequency tables. Throughout this lesson the students made very valuable contributions to discussions and were able to demonstrate a thorough understanding of all of the ideas presented.

Links were made between related areas of the syllabus in some cases. A good example of this was observed in a lesson on functions and graphs where each function was illustrated graphically. This is very important as a strategy for encouraging students to appreciate the interconnections between mathematical concepts and is essential for achieving full understanding. There was scope to develop this approach in some of the lessons observed. This was of particular note where simultaneous equations were solved in isolation to their graphical representations. It is recommended, wherever possible, that teachers exploit the natural links that exist across related topics in the work of lessons.

Some good practices were observed in relation to differentiation of learning. These included providing individual attention to any student experiencing difficulty, allowing students to work ahead in the textbook and encouraging students to work in pairs or groups to assist each other. In one case students were actively encouraged to explain mathematical concepts to each other; an approach that had many benefits for all students concerned. Through using these good differentiation practices most teachers ensured that the mathematical needs of each of their students were comprehensively met. Learning was not differentiated in all of the classrooms visited, however. There was evidence of a significant need for learning to be differentiated in the case of one class group because there were students studying Mathematics at different levels and only one of the levels was being taught. It is recommended that strategies to ensure that the individual needs of all students are being met be a feature of all lessons.

The quality of learning demonstrated by the students of the classrooms visited was very high in most cases. There was a strong sense of teamwork between students and teachers. Students collaborated and participated well and engaged enthusiastically in mathematical discussion. In one case there was scope for a significant increase in the level of students' involvement in the learning activities. However, overall, it was evident that students were taking responsibility for their own learning and were playing a very active role in ensuring that they achieved success in Mathematics.

The standard of student behaviour was observed to be very good with students demonstrating very high levels of co-operation with their teachers. In general teachers' management of learning activities and of student behaviour was very good. In one case classroom management would have benefited from a more structured approach. While in this case very good work was taking place, the high levels of student participation required more formal management.

Classroom atmosphere was conducive to developing students' confidence with the subject and in all cases the quality of relationships between the students and the teachers was good. There was a sense of warmth and care in the classrooms visited. Students responded well to the affirmation and praise frequently provided by their teachers.

ASSESSMENT

Overall, there was good practice in relation to assessment. Formal examinations, with reports sent home, are held at Christmas and in May. Students preparing for the certificate examinations sit 'mock' examinations early in the second term. Parent-teacher meetings are held annually. Common examination papers are set for each year group and level which is a good arrangement.

Teachers effectively assess learning on an ongoing basis through observation and oral questioning. Class tests are set at the end of each topic studied. In some cases teachers were using Assessment for Learning (AfL) principles in the correction of written work by including constructive and encouraging comments which is very good practice. In some classrooms visited students were instructed to correct their own or their classmate's work; this is a very good way of encouraging students to take responsibility for their own learning and an extension of its use is recommended.

Most lessons began with the checking and correction of the previous day's homework. In most cases teachers quickly assessed the extent to which homework needed to be completed on the board and only worked through those questions that required attention; this very good practice ensured that the correction of homework took up an appropriate amount of class time. However, this was not the case in all of the lessons observed. It is recommended that the good practice observed in the majority of lessons be extended to all lessons.

An analysis of the school's performance in the certificate examinations compared to national norms was included in the mathematics department plan which is good practice. In addition to this, it is recommended that the department consider comparing students' achievement in the certificate examinations with students' incoming assessment data in mathematics in order to provide them with a realistic and genuine measure of the school's contribution to students' performance. This would also allow the mathematics department to measure the correlation between students' ability and their achievement in the subject. This information should then be used in planning for Mathematics in the future.

SUMMARY OF MAIN FINDINGS AND RECOMMENDATIONS

The following are the main strengths identified in the evaluation:

- There is good whole school support for Mathematics in terms of time allocation and resource provision.
- Considerable work has been completed on the mathematics plan and a very good plan has been developed.
- The quality of teaching and learning observed was generally very good.
- A good variety of methodologies was used in the classrooms visited.
- There was a strong sense of teamwork between students and teachers. Students collaborated and participated well and engaged enthusiastically in mathematical discussion.
- Classroom atmosphere was conducive to developing student confidence with the subject and in all cases the quality of relationships between the students and the teachers was good.

- Very good opportunities are provided for students to engage in extracurricular mathematical activities.
- There is good practice in relation to assessment.

As a means of building on these strengths and to address areas for development, the following key recommendations are made:

- The school should review the arrangements made with regard to assignment to class groups and levels. Consideration should be given to delaying level choice until second year by assigning students to mixed-ability groups in first year.
- Mathematics lessons, for any year group where students are assigned to higher and ordinary-level classes, should be concurrently timetabled where possible.
- The new syllabus documents should now become the focus for planning the programmes of work for Mathematics. This work should centre on interpreting the syllabuses in a way that exploits cross-topic links and ensures a solid understanding of the learning outcomes for students is achieved.
- The mathematics teaching team should work together on sharing ideas for the development of a common TY programme that focuses on providing alternative mathematical experiences for students.
- The value of class time should be optimised by including a variety of strategies to ensure that students remain actively engaged as learners for the duration of lessons.

A post-evaluation meeting was held with the teachers of Mathematics and with the principal (acting) and deputy principals at the conclusion of the evaluation when the draft findings and recommendations of the evaluation were presented and discussed.